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Device for authorizing the selection of a cell in a terminal of a cellular mobile radio network in the standby state
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**COMPLETE SPECIFICATION
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Invention Title:

**DEVICE FOR AUTHORIZING THE SELECTION OF A CELL IN A TERMINAL OF
A CELLULAR MOBILE RADIO NETWORK IN THE STANDBY STATE**

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The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

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DEVICE FOR AUTHORIZING THE SELECTION OF A CELL
IN A TERMINAL OF A CELLULAR MOBILE RADIO
NETWORK IN THE STANDBY STATE

BACKGROUND OF THE INVENTION

5 Field of the invention

The invention is generally concerned with mobile radio networks.

The present invention is more particularly concerned with a terminal for a cellular mobile radio network, such as the GSM network in particular, and even
10 more particularly with a device for authorizing the selection of a cell in a terminal of this kind in the standby state.

Description of the prior art

15 To be able to receive calls in the standby state, a terminal of this kind must execute a number of functions, such as listening out for "paging" messages in particular. These messages are broadcast in each cell on a broadcast control channel characteristic of the cell.

20 The terminal continuously selects the optimum cell, i.e. that for which transmission quality is the highest, to listen to these paging messages.

A parameter representative of the transmission quality is therefore defined, allowing in particular for
25 the signal level as received by the terminal in a cell on the broadcast control channel of that cell, to which end the broadcast control channel is broadcast continuously in that cell.

This parameter, known as "C1" in the case of the
30 GSM system, for example, is described in more detail on pages 453 through 455 of "The GSM System for Mobile Communications" by Michel MOULY and Marie-Bernadette PAUTET (Europe Media Duplication - 1992).

Briefly, in the GSM system, to select a cell the
35 terminal calculates the parameter C₁ for each of the

various cells surrounding it, eliminates those cells for which the value of C_1 obtained is below a given cell selection threshold, selected to guarantee a guaranteed grade of service to the user once a call involving the terminal has been set up in the cell selected in this manner, and retains whichever of the
 5 cells obtained in this way yields the highest value C_1 .

If no value of C_1 above the cell selection threshold can be found, because receive levels are too low, no cell can be selected and the terminal is unable to access the network to set up calls.

An essential aim of the present invention is to reduce the number of
 10 situations in which a terminal is prevented in this way from accessing the network, because no cell can be selected, or in other words, to enlarge to some degree the coverage area of the network.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides a device for authorizing
 15 selection of a cell in a cellular mobile radio network terminal in a standby state, including means for calculating a parameter representative of transmission quality with reference to said cell, means for determining if said parameter has a sufficient value relative to a cell selection threshold, and for authorizing, if said parameter has a sufficient value relative to a call selection threshold, in relation
 20 to said cell, setting up of a call involving said terminal, and means for determining, if said parameter does not have a sufficient value relative to said cell selection threshold, if it has a sufficient value relative to a cell deselection threshold, less than the cell selection threshold, and if it has, to authorize, in relation to said cell, some or possibly all of the functions relating to setting up of
 25 a call involving said terminal.

According to another feature of the invention, the device may include means for comparing the various parameters obtained in this way which have a sufficient value relative to said cell deselection threshold in order to determine the best of said cells, relative to which some or even all of said functions relating
 30 to the setting up of a call involving said terminal will be authorized.

According to another feature of the invention, said part of the functions relating to call set-up may be that part enabling production of a paging signal in the case of an incoming call relevant to said terminal.

5 According to another feature of the invention, said part of the functions relating to call set-up may be that part enabling listing to common channels, including short messages, broadcast on a broadcast control channel characteristic of said cell.

10 According to another feature of the invention, the device may further include means commanding the production of a signal intended to alert the user to the risk of non-optimal grade of service when some or even all of the functions relating to the setting up of a call involving said terminal are authorized in this way.

15 The present invention applies in particular to terminals which, when they change from the standby state to a communication state or at some other time, change from a degraded mode of operation, in which receive levels are too low to authorize the selection of a cell on the basis of the cell selection threshold, to a non-degraded mode of operation in which the receive levels are sufficient to authorize cell selection. One example of the degraded mode is that of a portable terminal in the standby state, in the pocket of the user, with its antenna stowed. One example of the non-degraded mode may be that of the same terminal held in the hand with its antenna deployed.

20 Accordingly, in this application example the present invention, unlike the prior art as outlined above, can authorize the production of a paging signal in the case of an incoming call addressed to the terminal when the latter is in the degraded mode. Alerted by this paging signal, the user can then take the terminal out of their pocket, deploy the antenna and, the non-degraded mode then being operative, take the call in the normal manner.

25 Another example of the degraded mode is that of a terminal temporarily encountering unfavorable radio signal propagation conditions as the user moves around.

30 A preferred embodiment of the present invention will now be described with reference to the appended drawing.

BRIEF DESCRIPTION OF THE DRAWING

The single figure in the appended drawing is a block schematic of one embodiment of a device in accordance with the invention and the components of a mobile radio network terminal necessary to its operation.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The schematic shows, in a manner that is known in itself, between an antenna 1 and a duplexer 2, on the one hand, and a man-machine interface means 3 of the terminal, on the other hand:

- an uplink channel including:

. means 4 for detecting activation of certain units of the man-machine interface, such as the keypad of the terminal in particular, and producing corresponding messages,

. means 5 for producing, on the basis of the aforementioned messages, common or dedicated uplink signaling channels,

. a transmitter 6,

- a downlink channel including:

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.. a receiver 7,

. downlink common or dedicated signaling channel listening means 8,

5 . means 9 for producing corresponding signals, necessary for activation of certain units of the man-machine dialogue means, such as a buzzer, a screen, etc.

The schematic also shows means 10 for cell selection in the standby state.

10 In a manner known in itself, the means 10 for cell selection in the standby state include:

- means 11 for measuring the level of the output signals from the receiver 7, for a given tuned frequency of the receiving means, corresponding to the broadcast control channel of one of the various surrounding cells, the broadcast control channel in question being indicated by a control signal T_1 applied to the corresponding control input of the receiver 7 and obtained from a sequencer 12 sequencing the operations of cell selection in the standby state,

20 - means 13 for calculating a parameter C_1 representative of transmission quality in relation to the cell for which a level is measured as above by the means 11,

25 - means 14 for detecting if the value of the parameter calculated in this way is above a cell selection threshold,

- means 15 for storing the value C_1 above the cell selection threshold detected in this way,

30 - means 16 for detecting the greatest of the values stored in this way.

The cell selection threshold is selected to guarantee a given grade of service Q_1 to the user when a call involving the terminal is set up in the cell selected in this way by means 16.

35 The means 16 supply a first control signal S_1 which

commands tuning of the local frequency of the receiver 7 to the broadcast control channel of the cell selected by the means 16. The means 16 also supply a second control signal S_2 commanding the means 8 to listen to common channels, including paging channels, broadcast on the broadcast control channel of the cell selected by the means 16.

In accordance with the invention, the means 10 for cell selection in the standby state further include:

- means 19 for detecting if the magnitude C_1 calculated by the means 13 is above a cell deselection threshold lower than the cell selection threshold,
- means 20 for storing the values greater than the cell deselection threshold detected in this way,
- means 21 for detecting the greatest of the values stored in this way.

The cell deselection threshold is detected to guarantee a grade of service Q_2 which in this instance is below the grade of service Q_1 .

The means 21 supply a first control signal S'_1 commanding tuning of the local frequency of the receiver 7 to the broadcast control channel of the cell selected by the means 12.

The means 21 further supply a second control signal S'_2 commanding the means 8 to listen to common channels, including paging channels, broadcast on the broadcast control channel of the cell selected by the means 21.

The signals S_1 , S_2 , S'_1 and S'_2 are applied to a circuit 22 supplying signals S''_1 and S''_2 respectively equal to the signals S_1 and S_2 when the latter signals indicate that a cell can be selected on the basis of the cell selection threshold or to the signals S'_1 and S'_2 when the latter signals indicate that no cell can be selected on the basis of the cell selection threshold.

If no cell can be selected, either on the basis of

the cell selection threshold or on the basis of the cell deselection threshold, the signals S''_1 and S''_2 isolate the receiver 7 and the means 8 listening to common channels including paging channels.

5 The cell selection process as described above is repeated continuously (possibly in parallel with listening to paging channels broadcast on the broadcast control channel of the selected cell) by means of commands issued by the sequencer 12. Like the means 7,
10 the means 8, 11, 13, 14, 15, 16, 19, 20 and 21 are therefore controlled by respective control signals T_2 through T_{10} issued by the sequencer 12.

15 The signal T_1 or S''_1 applied to the receiver 7 is selected by a circuit 23 and the signal T_2 or S''_2 applied to the means 8 for listening to the common channels is selected by a circuit 24.

20 In this embodiment, one of the signals from the circuit 22, for example the signal S''_2 , is fed to a control input of the means 4 for detecting activation of the man-machine interface and producing corresponding messages. In this instance, this command disables the production of the messages usually produced by the means 4 on detection of call acceptance by the user. The
25 production of a message of this kind is authorized if a cell can be selected on the basis of the cell selection threshold or prohibited if no cell can be selected on the basis of the cell selection threshold but a cell can be selected on the basis of the cell deselection threshold.

30 This embodiment corresponds in particular to the application example mentioned above, i.e. to the situation in which, alerted by a paging signal, the user changes the terminal from a degraded mode of operation to a non-degraded mode of operation, for example by removing it from their pocket and deploying the antenna.

35 As the selection process is repeated continuously,

a cell can then be found on the basis of the cell selection threshold and the call can then take place in the normal manner, i.e. with the grade of service Q₁.

5 The above example therefore corresponds in particular to the situation in which said part of the functions relating to call set-up is that enabling the production of an incoming paging signal.

10 Other examples are nevertheless feasible; for example, said part of the functions relating to call set-up could consist in the listening to common channels, in particular short messages, broadcast on the broadcast control channel of the cell in question.

15 In none of the feasible application examples is there is anything to prevent authorization of all of said options, even if this entails the risk of a non-optimal grade of service.

20 In this case a signal could be generated to alert the user to the risk of non-optimal grade of service, for example a message on the screen of the terminal.

In the example given above this could be achieved by applying one of the signals from the circuit 22, for example the signal S'₂, to the means 9 commanding activation of the man-machine interface.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Device for authorizing selection of a cell in a cellular mobile radio network terminal in a standby state, including means for calculating a parameter representative of transmission quality with reference to said cell, means for determining if said parameter has a sufficient value relative to a cell selection threshold, and for authorizing, if said parameter has a sufficient value relative to a call selection threshold, in relation to said cell, setting up of a call involving said terminal, and means for determining, if said parameter does not have a sufficient value relative to said cell selection threshold, if it has a sufficient value relative to a cell deselection threshold, less than the cell selection threshold, and if it has, to authorize, in relation to said cell, some or possibly all of the functions relating to setting up of a call involving said terminal.
2. Device according to claim 1 further including means for comparing the various parameters obtained in this way which have a sufficient value relative to said cell deselection threshold in order to determine the best of said cells, relative to which some or even all of said functions relating to the setting up of a call involving said terminal will be authorized.
3. Device according to claim 1 wherein a part of said functions relating to call set-up is that part enabling production of a paging signal in the case of an incoming call relevant to said terminal.
4. Device according to claim 1 wherein a part of the functions relating to call set-up is that part enabling listing to common channels, including short messages, broadcast on a broadcast control channel characteristic of said cell.
5. Device according to claim 1 further including means commanding the production of a signal to alert the user to the risk of a non-optimal grade of service when some or even all of said functions relating to the setting up of a call involving said terminal are authorized in this way.

6. A device for authorizing selection of a cell in a cellular mobile radio network terminal in a standby state substantially as hereinbefore described with reference to the accompanying drawing.

5 DATED: 20 July 1999

PHILLIPS ORMONDE & FITZPATRICK

Attorneys for:

SOCIETE ANONYME DITE : ALCATEL MOBILE PHONES

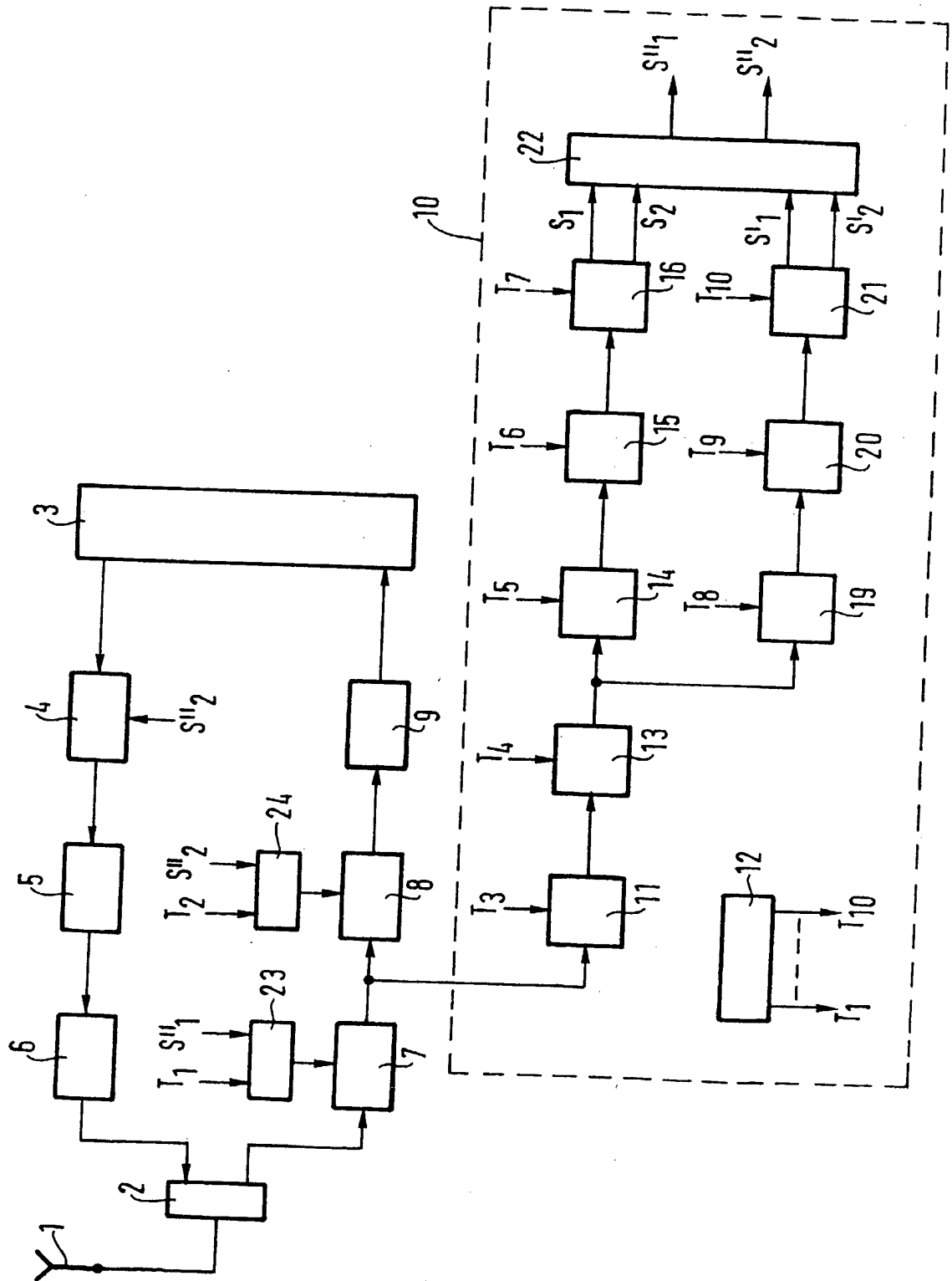
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ABSTRACT OF THE DISCLOSURE

To authorize the selection of a cell in a cellular mobile radio network terminal in the standby state, a parameter is calculated representative of the transmission quality with reference to that cell. If the parameter has a sufficient value relative to a cell selection threshold, setting up of a call involving said terminal is authorized in relation to that cell. If the parameter does not have a sufficient value relative to the cell selection threshold, but has a sufficient value relative to a cell deselection threshold, less than the cell selection threshold, some or possibly all of the functions relating to setting up of a call involving said terminal are authorized in relation to that cell.



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AUTOMATED WIRELESS-CALL COMPLETION USING A PAGING NETWORK

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(57) Claim

1. A wireless call completion method comprising the steps of:
in response to a call incoming for a wireless radiotelephone,
transmitting a paging signal to a pager associated with the wireless radiotelephone;
in response to receiving the paging signal at the pager, enabling the
wireless radiotelephone to receive the incoming call; and
subsequently to the transmitting of the paging signal, extending the
incoming call to the enabled wireless radiotelephone.

26. A telecommunications system comprising:
a selectively-enabled wireless radiotelephone;
a pager associated with the wireless radiotelephone;
a paging exchange for transmitting paging signals to the pager;
a wireless call exchange for extending calls incoming for wireless
radiotelephones to enabled said wireless radiotelephones; and
means responsive to a call incoming for the wireless radiotelephone into
the wireless call exchange, for causing the paging exchange to transmit a paging
signal to the pager, the paging signal being such that receipt of the paging signal at
the pager results in enablement of the wireless radiotelephone to receive the
incoming call.

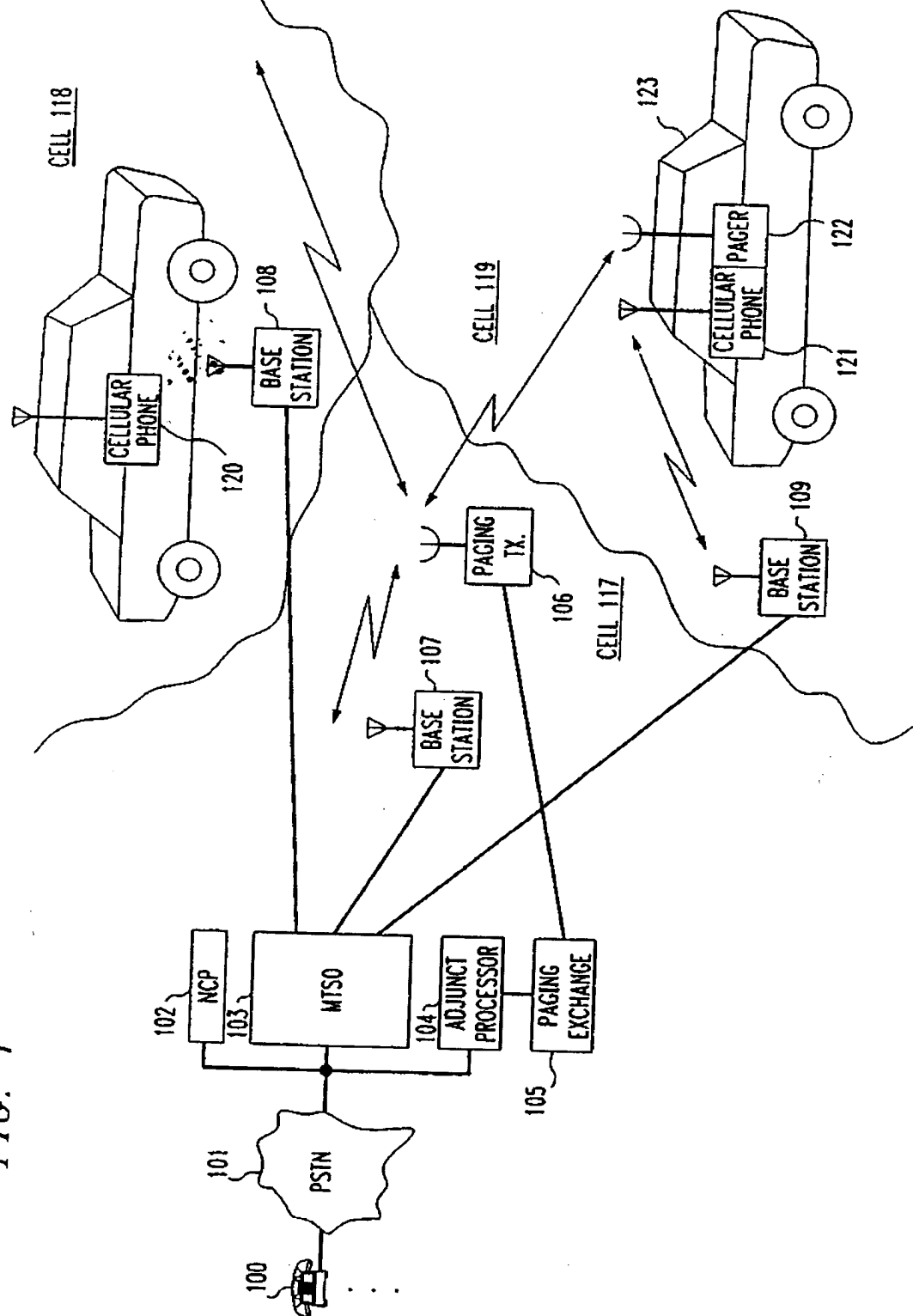


FIG. 1